

STATE OF VERMONT  
PUBLIC SERVICE BOARD

Docket No. 6107

Tariff filing of Green Mountain Power Corporation )  
requesting a 12.9% rate increase, to take effect )  
June 22, 1998 )

PREFILED TESTIMONY OF  
THOMAS DUNN  
ON BEHALF OF THE  
VERMONT DEPARTMENT OF PUBLIC SERVICE

September 18, 1998

Summary: The purpose of Mr. Dunn's testimony is to: (1) discuss shortcomings in Green Mountain Power Corporation's reliability reporting, tree trimming and pole inspection programs; (2) discuss the consequences of these shortcomings; and (3) offer remedies that the Public Service Board should order the company to implement.

Prefiled Testimony  
of  
Thomas Dunn

1 Q. Please state your name and occupation.

2 A. My name is Thomas Dunn, and I am the Chief of Utilities Engineering at the Public  
3 Service Department.

4 Q. Please summarize your relevant educational experience.

5 A. I received a Bachelor of Science degree in Marine Engineering from Massachusetts  
6 Maritime Academy, Buzzards Bay, Massachusetts in 1983. My studies included courses  
7 in electrical engineering, electronics and power generation. In 1992, I received a Masters  
8 in Business Administration degree from Boston College, Chestnut Hill, Massachusetts. I  
9 completed courses in statistical analysis, financial theory, corporate finance, and  
10 managerial and financial accounting. In 1987, I attended Power Technologies, Inc.'s  
11 Underground Cable Systems Course. This course dealt primarily with the design,  
12 construction and installation of underground transmission cables.

13 Q. Please describe your work experience.

14 A. As a Third Assistant Engineer, licensed to operate steam and diesel powerplants of  
15 unlimited horsepower from the U.S. Coast Guard, I worked in the U.S. Merchant Marine  
16 for three years serving as both watch officer and electrical officer. As electrical officer, I  
17 operated, maintained and repaired shipboard electrical systems.

18 Subsequent to my experience in the Merchant Marine, I worked for the  
19 Massachusetts Electric Company as a field engineer where I designed electric distribution  
20 systems for new housing, commercial and industrial developments. I evaluated the current  
21 transmission and distribution system and specified the necessary changes to serve new  
22 loads and to improve system reliability. I supervised crews in the maintenance, operation

1 and emergency repair of the transmission and distribution systems. While at the  
2 Massachusetts Electric Company, I attended numerous courses in the construction, design  
3 and maintenance of electrical transmission and distribution systems from 4 kV up to 345  
4 kV.

5 Q. What is the purpose of your testimony?

6 A. The purpose of my testimony is to: (1) discuss shortcomings in Green Mountain  
7 Power Corporation's ("GMP") reliability reporting, tree trimming and pole inspection  
8 programs; (2) discuss the consequences of these shortcomings; and (3) offer remedies that  
9 the Public Service Board should order the company to implement.

10 **Reliability Reporting**

11 Q. In what way does GMP's reliability reporting understate the amount of outage time  
12 experienced by GMP customers?

13 A. GMP reliability reporting understates number of outage-hours experienced by  
14 GMP's customers because the company has, in the past, failed to include outages caused  
15 by transmission failures, major storms and outages due to single transformer fuses in  
16 reporting reliability statistics (See Dkt. No. 5983, GMP response to DPS 1-187).

17  
18 Q. What are the consequences of failing to capture all outages in preparing reliability  
19 statistics?

20 A. The obvious consequence is that the GMP's reliability performance will look better  
21 than it actually is. Also, to the extent that GMP is relying on this reliability data to make  
22 resource allocation decisions, there arises the possibility of misallocation of scarce  
23 resources.

1 Q. What recommendations do have for GMP in the reliability reporting area?

2 A. First, if possible, GMP should use the raw outage data from the last 5 years and  
3 redo their outage indices using the definitions in the Reliability Task Force Report (See  
4 Exhibit TD-1). This may not be possible if GMP has not maintained records about past  
5 outages which occurred on its transmission system and during major storms. Second,  
6 GMP should be required, on a going forward basis, to report their reliability performance  
7 using the definitions and indices contained in the Reliability Task Force Report<sup>1</sup> to the  
8 PSB and DPS by March 31 of following year.

9 **Tree Trimming**

10 Q. Do you believe that there are serious problems with GMP's tree trimming program?

11 A. Yes.

12 Q. What evidence have you seen or examined that supports this conclusion?

13 A. I have examined GMP documents which review GMP's maintenance program and  
14 have had several conversations with personnel from GMP and other Vermont utilities  
15 about GMP's tree trimming program. GMP personnel involved with the company's  
16 current trimming program, in discussions with Mr. Litkovitz and myself, have  
17 acknowledged that there are shortcomings in GMP's present trimming program. I have  
18 also reviewed GMP's responses to numerous Department's discovery questions (Docket  
19 No. 5983) which focused on GMP's maintenance practices. In the last year or two, I have

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<sup>1</sup>The reliability task force was a group comprised of representatives from most of the state's electric utilities and the Department of Public Service. The group was created to develop standardized reliability reporting definitions and selection of which reliability indices to report. The report recommendations, while not representing 100% agreement on all of the issues by all parties, were generally supported by the group. GMP's representative was present at all of the meetings and actively contributed to the report. GMP's representatives on the Task Force indicated that the company would agree to do the reliability reporting as requested here.

1 examined several GMP transmission rights-of-way (“ROW”) and have noticed a number  
2 of instances where the clearances were inadequate. Finally, the Department has received  
3 complaints from Washington Electric Cooperative (“WEC”) about outages on GMP’s  
4 subtransmission system that have caused repeated and lengthy outages for WEC members  
5 in the Moretown and West Danville substations (See Exhibit TD-2). Many of the outages  
6 noted were due to tree contacts, which I believe are symptomatic the systemic problems in  
7 GMP’s trimming program.

8 Q. Please review some of the evidence that highlights the problems with GMP’s trimming  
9 program.

10 A. A document titled *Preventative Maintenance Overview* (“PMO”) dated February  
11 2, 1998, was provided to the Department in March of 1998 (See Exhibit TD-3). This  
12 review was produced by GMP’s Preventative Maintenance Overview Committee which  
13 “examined preventative maintenance issues impacting the reliability of the facilities serving  
14 GMP customers” (PMO, p. 3). The committee was comprised of experienced line and  
15 engineering personnel at GMP and the report produced by the committee was distributed  
16 to GMP management. It was also reviewed by a consultant hired by GMP to review the  
17 company’s performance during the January 1998 ice storm (See Exhibit TD-4). The  
18 consultants, Mr. Blanchet and Mr. Perry, noted the PMO, “represents a lot of thoughtful  
19 work and is worthy of careful review.” (January Ice Storm Review, p. 22). The PMO  
20 suggests serious problems with certain aspects of GMP’s right-of-way management  
21 program. “The following are *extremely important* (emphasis in the original) items critical  
22 to the continued reliability of the power system. Three of the five items are  
23 **unsatisfactory and require immediate attention**”. (PMO, p. 3, emphasis added). Item  
24 3 of the list of items that are unsatisfactory and requiring immediate attention is vegetative  
25 management. The report notes:

26 Under the present tree-trimming program, tree related events are

1 increasing. Restoration delays can also be expected to increase because of  
2 biomass accumulations in power line corridors. Restoration delays will be  
3 particularly devastating during Veterans' Day 1990 class storms. The  
4 present program requires significant modification. (PMO, p. 3)

5 Discussions with other New England utilities reveal a dominant recurring  
6 theme: Vegetative management is a well-funded, headed by a full-time  
7 manager. The Trimming Process Teams finds that **tree trimming is under**  
8 **funded at GMP** (emphasis added). Each year we are funded at the  
9 present levels, we fail to remove the equivalent of the vegetative biomass  
10 increase for that year. (PMO, pp. 8-9)

11 Q. Are there other indications that GMP's program is inadequate?

12 A. Yes. In looking at the details of GMP's tree trimming program I found a program  
13 that: (1) does not have a vegetative management plan in use; (2) has individuals  
14 preparing the tree trimming budgets, implementing and supervising the program who are  
15 not trained utility arborists; (3) is reactive in nature; and (4) is likely not removing the  
16 annual tree and shrub growth occurring in its rights-of-way.

17 Q. Please provide additional information on the points noted in the previous question.

18 A. From 1993 to 1997, GMP spent an average of \$888,088 per year on transmission  
19 and distribution trimming. Yet GMP does not have a vegetative management plan. GMP  
20 in response to a request for a copy of GMP's ROW maintenance plan, indicated that,  
21 "There are no formal plans". (Dkt. No. 5983, DPS Discovery 1-148) In another discovery  
22 response GMP provided a copy of a document titled *GMP's Integrated Vegetative*  
23 *Management Program* ("IVMP") (Dkt. No. 5983, DPS Discovery 2-194). This plan  
24 contained information that noted that it is GMP's policy that, "Rights-of-way will be

1 maintained on a 4 to 6-year cycle unless an adjustment in scheduling is necessary as a  
2 result of unusual vegetation conditions or environmental factors.” (IVMP, p.7) The plan  
3 also calls for the use of herbicides in ROW management as an integral part of its  
4 vegetative management plan. However, in discussions with GMP, the company has  
5 indicated that it has not used herbicides in approximately ten years<sup>2</sup>. The company  
6 indicated that it does not use the IVMP<sup>3</sup>.

7 GMP’s program is reactive in nature. GMP does not have an utility arborist on  
8 staff. The budgets are developed, based in large part, in responding to “problem areas.”  
9 GMP is thus forced to respond to hot spots. The trimming budget is developed by each  
10 district’s Customer Operations Manager with input from individuals who have reviewed  
11 previous year outage history, results of helicopter and foot patrols and trouble orders.  
12 The budget is then submitted to the Area Manager and then to the Controller for approval.

13 A better method, as demonstrated by Central Vermont Public Service  
14 Corporation’s (“CVPS”) and Vermont Electric Power Company’s (“VELCO”) trimming  
15 programs, is a vegetative management plan that is preventive in nature. CVPS and  
16 VELCO strive to remove the trees before the problems occur. Because GMP does not  
17 have an inventory of the tree species and the relative concentrations present in its rights-  
18 of-way, nor the growth rates of these species in various parts of its system, it is unable to  
19 implement a preventive trimming program.

20 There are several indications that GMP is falling behind in the trimming of its  
21 ROWs. First, GMP’s Preventative Maintenance Overview notes that “Each year we are  
22 funded at the present levels, we fail to remove the equivalent of the vegetative biomass

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<sup>2</sup>Phone conversation with Walter Oakes, GMP’s Central Area Manager, on September 11, 1998.

<sup>3</sup>Meeting on 9/15/98 at GMP’s Montpelier office attended by the GMP’s Joe Ferro, Jim Fontaine, Walter Oakes, Terry Checchini, and Andy Letourneau. Steve Litkovitz and I attend from the Department.

1 increase for that year.” (PMO, p. 9) Second, I have observed GMP subtransmission  
2 ROW where the trees were growing up into the conductor and other places where the  
3 cleared ROW was quite narrow. Finally, there appears to be an increasing number of tree  
4 contacts as noted in the PMO and in GMP responses to complaints by WEC.

5 Q. Please provide details on the WEC complaints about the level of reliability provided by  
6 GMP.

7 A. Seven of WEC’s eight substations are supplied by GMP’s 34.5 kV subtransmission  
8 system. In 1997, WEC’s Moretown substation experienced eight outages. Each of these  
9 outages affected approximately 1,100 WEC members. Walter Oakes, GMP’s Assistant  
10 Vice President, noted that “There is no question that the line had a significant number of  
11 disturbances in 1997.” (See Exhibit TD-2, p. 1 GMP’s 3/10/98 response.) Several of the  
12 outages were caused by tree contacts. In observing portions of the 3310 ROW it was clear  
13 that the corridor was quite narrow, in places it appeared to be less than 30 feet wide. In  
14 responding to WEC’s complaint, GMP supplied the recent history of trimming on the  
15 3310 line. Assuming that ninety percent of the line is treed, then it appears, based on the  
16 average number of feet trimmed over the last nine years, that GMP is maintaining  
17 approximately a 9 year cycle on the 3310 line. Given that several miles of this line have  
18 only a 30 foot ROW, this cycle may be inadequate to provide reliable service. GMP has  
19 taken steps (e.g., increased foot patrols, installation of sectionalizing equipment) that  
20 should offset some of my concerns about trimming on the 3310 line.

21 On August 24<sup>th</sup> and 25<sup>th</sup> 1998, the GMP subtransmission lines supplying WEC’s  
22 West Danville substation (serving 391 WEC members) was out of service for eighteen  
23 hours and GMP’s feed to WEC’s South Walden substation (serving 991 WEC members)  
24 was out for three hours. The outages were due to damage which occurred during an  
25 intense thunderstorm. From initial conversations with GMP personnel, it appears that  
26 there was one broken pole on both GMP’s 3316 and 3319 lines. Initial reports suggest



1           that the poles were broken by trees. GMP will be providing the Department and WEC  
2           with additional information about GMP response to this outage as soon as it is available.

3       Q.     What are the potential consequences of the shortfalls in GMP's trimming program?

4       A.           The consequences of an inadequate trimming program can be quite severe. GMP's  
5           retail and wholesale customers will experience increased frequency and duration of  
6           outages caused by tree contacts. This may already be the case but because GMP did not  
7           in the past report outages due to transmission problems and major storms, the impacts  
8           may have been masked in the reliability statistics reported by the company (See Dkt. No.  
9           5983, GMP response to DPS 1-187). The reliability of GMP's system impacts not only  
10          GMP's retail customers, but also its wholesale customers who receive service from  
11          GMP's subtransmission system. As shown in Exhibit TD-5 there are several thousand  
12          retail customers, served by other distribution entities, who rely on power from GMP's  
13          subtransmission system. GMP, in tabulating reliability statistics, would, for an outage on a  
14          GMP transmission line, count these wholesale customers as single customers. In fact,  
15          when GMP has an outage on one of its transmission lines that serve these wholesale  
16          customers, hundreds or even thousands of retail customers are affected.

17                The length of time to repair outages will increase as access to cross-country ROW  
18           will be more difficult due to the heavier growth in the corridors. In the Summer of 1997, I  
19           had difficulty even walking in a GMP 34.5 kV corridor in Middlesex because of the  
20           extensive growth in the ROW. The severity of the damage to GMP's T&D system will  
21           increase in storm conditions as trees will fall and break poles, crossarms and conductors.  
22           This too will increase the length of service restoration. Finally, there is a concern about  
23           public safety due to long outages caused by tree-related incidents and public exposure to  
24           dangerous situations created by tree-damaged utility plant (e.g., broken poles, downed  
25           wires, etc.) The bottom line conclusion is that reliability will suffer while the cost to  
26           maintain the system will increase.

1 Q. What recommendations do make with respect to GMP's trimming program?

2 A. As indicated in more recent reviews of GMP's trimming practices, as well as from  
3 field observation, and customer complaints, there does not appear to be a systematic  
4 vegetative management program in place at GMP. Due to the reactive nature of the  
5 current program there is a concern that GMP may not be using its tree trimming  
6 expenditures in the most cost effective manner. In addition, the current level of  
7 expenditures may or may not represent the appropriate amount of spending for tree  
8 trimming. GMP must undertake a comprehensive review of its ROW practices to  
9 determine the most cost effective way to maintain its corridors. The examination should,  
10 among other things, include an inventory of trees species, estimated tree-growth rates in  
11 GMP's corridors in various parts of the state, a determination of the appropriate trimming  
12 cycle and a review the role of herbicides in maintaining GMP's ROW. The work product  
13 from the investigation should be a plan which GMP could implement over a period of  
14 years. The report should also estimate the cost to implement such a plan. To do this the  
15 company needs to obtain the services of a professional forester or utility arborist or other  
16 similarly trained individual. It is likely that this individual or individuals will be needed by  
17 GMP on a long-term basis to both manage the investigation and to supervise the  
18 implementation of the plan. The Board should order GMP to undertake such study and  
19 complete it by June 1, 1999. The company should provide the Board and Department  
20 with an interim progress report in March 1, 1999.

21 Once the cost to support the program is known, it is necessary to ensure that GMP  
22 spend the funds needed to support the full implementation of the program. Mr. Steinhurst  
23 addresses this issue in his testimony.

24 **Pole Inspections**

25 Q. Have you examined information about GMP's pole inspection program?

26 A. Yes.

1 Q. What conclusions have you reached about GMP's pole inspection program?

2 A. I conclude that GMP has been under investing in its pole inspection program. As a  
3 result, it is likely that ratepayers will pay for the costs of prematurely replacing wood poles  
4 on GMP's T&D system. In addition, both retail and wholesale customers will experience  
5 more frequent and longer power outages than they would have had the company  
6 maintained an up-to-date inspection program. There is also some concern about public  
7 safety to the extent that under investment in the program results in pole failures that might  
8 not have happened had the company kept its program up to date.

9 Q. What information did you examine in reaching your conclusions?

10 A. I examined the *Preventative Maintenance Overview* ("PMO") dated February 2,  
11 1998. As I have previously noted the PMO suggests serious problems with certain aspects  
12 of GMP's right-of-way management program. Item 5 of the list of items that are  
13 unsatisfactory and requiring immediate attention is transmission wood pole inspection and  
14 treatment. The report notes:

15 More than eighty percent of the 5300 transmission poles are due for inspection. A  
16 series of transmission pole failures during a major ice storm could have a  
17 significant impact on customer restoration. (PMO, p. 3)

18 The report of the consultants hired by GMP to review the company's performance during  
19 the January 1998 ice storm (See Exhibit TD-4) noted, "Wood pole testing has slipped in  
20 recent years....Ultimately, a lack of pole testing and treating or replacing can have  
21 consequences. (P.22)

22 The PMO cites that the number of poles needing to be inspected is approximately  
23 4,400 poles and states that the last transmission pole inspected was in 1986 (PMO, p. 10).  
24 In recent conversations with personnel at GMP it appears that the company inspected

1 approximately 637 poles in 1997<sup>4</sup>. It is not clear whether GMP needs to inspect an  
2 additional 4,400 poles or 3,763 poles. Whatever the exact number of transmission poles  
3 that need to be inspected is, the program, as noted on page 10 of the PMO, is clearly  
4 behind the nine-year schedule GMP has historically maintained. In addition, it appears  
5 that inspection of GMP's distribution poles is also behind schedule. The PMO categorizes  
6 as being "**very important** (emphasis in the original) items critical to the continued  
7 reliability of the power system...The inspection and treatment of wood poles is as  
8 necessary for distribution as for transmission. Although a failure will impact fewer  
9 customers, there is greater public exposure." (PMO, p. 4)

10  
11 Q. Did you talk with other Vermont utilities to learn about other pole inspection programs?

12 A. Yes. I spoke with Ed Congdon, Manager of Field Services, Vermont Electric  
13 Power Company ("VELCO"). Mr. Congdon said that VELCO inspects its poles fifteen  
14 years after they are installed and then every ten years thereafter. VELCO pays  
15 approximately \$43 per pole for an inspection. VELCO solicits bids from the two primary  
16 companies in the pole inspection business, OSMOSE and Asplundh. VELCO has  
17 approximately 10,000 wood poles (mostly western red cedar). VELCO is on cycle with  
18 its pole inspections. The typical inspection involves a below grade inspection (15 to 18  
19 inch) to check for internal voids or external rot. The interior is treated as necessary and  
20 the exterior of pole is then treated and wrapped with a tar paper to keep the treatment  
21 against the pole. In 1998, 20 of the 1200 poles VELCO inspected failed which Mr.  
22 Congdon indicated was a higher percentage than normal.

23 At CVPS I spoke with Dwayne Dickenson, Manager of Right of Way

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<sup>4</sup>Meeting on 9/15/98 at GMP's Montpelier office attended by the GMP's Joe Ferro, Jim Fontaine, Walter Oakes, Terry Checchini, and Andy Letourneau. Steve Litkovitz and I attend from the Department.

1 Maintenance, and David Watts, Manager of Transmission Construction. Both Mr. Watts  
2 and Mr. Dickenson indicated that CVPS inspects its distribution and transmission poles  
3 twenty years after they are installed and then once every ten years thereafter. CVPS  
4 inspects approximately 6,000 distribution poles and 1,000 transmission poles annually.  
5 The cost to inspect transmission and distribution poles is \$40 and \$26 respectively. CVPS  
6 is seeing an approximate .5% failure rate for its transmission poles and about a 1.6% for  
7 its distribution poles.

8 I also spoke with Mr. Keith Wherry, Regional Vice President, Osmose Wood  
9 Preserving, Inc. He confirmed that standard utility practice is to inspect new poles fifteen  
10 to twenty years after installation and then every ten years thereafter. He estimated the  
11 costs approximately \$35 to \$45 to inspect transmission poles and between \$25 to \$35 to  
12 inspect distribution poles.

13  
14 Q. What are the consequences of failing to do pole inspections?

15 A. The consequences, as noted GMP's *Preventative Maintenance Overview*, could  
16 involve extensive damage to poles and related equipment during severe storms causing  
17 widespread, lengthy outages for GMP's retail and wholesale customers. Recent outages  
18 in Lyndonville (a wholesale customer of CVPS supplied by a CVPS owned and operated  
19 34.5 kV subtransmission line) and WEC's West Danville substation demonstrate the  
20 length of outages that can occur when there are problems with poles in cross-country  
21 transmission ROW. In addition to the increased outage risk, there is an additional public  
22 safety concern— that a pole could fall and injure people or damage property or both. I am  
23 aware of a recent press report that a rotted GMP distribution pole toppled near a busy  
24 street in Essex Junction. The report indicated that no one was injured though the situation  
25 clearly had potential to have had far more serious consequences.

26 One other consequence is that poles will not last as long. All the individuals I  
27 spoke with about pole inspections indicated that treated poles last considerably longer

1 than untreated poles. Some of the individuals suggested that treated poles could last up  
2 twice as long as untreated poles. Should GMP continue to under fund its pole inspection  
3 program it is certain that some of its poles will fail prematurely (i.e., earlier than they  
4 would have failed had GMP maintained an industry standard inspection practice).

5 Q. What recommendations do you have with regard to pole inspections?

6 A. I recommend that GMP develop and implement a plan to get their transmission and  
7 distribution pole inspection program on a ten-year cycle. GMP's plan should cover how it  
8 will "catch up" to the ten-year cycle. I would expect that some sort of phasing (i.e.,  
9 doing two years worth of inspections in each of the first few years) may be necessary.  
10 This plan should be submitted to the PSB and DPS for review and approval. The plan  
11 should be implemented beginning in 1999 with actual inspections beginning as soon as  
12 weather permits in 1999.

13 Q. Would GMP need to increase its O&M budget to allow the company to inspect the  
14 required number of poles to get on an acceptable inspection cycle and to develop and  
15 implement a more effective trimming plan?

16 A. Yes. GMP would need additional O&M dollars to support an increased pole  
17 inspection program and more effective trimming plan. The company presently budgets  
18 \$815,000 year for distribution and transmission trimming. In addition, to the extent the  
19 company has done any pole inspections, the cost for the inspections also comes from this  
20 amount. Assuming a 5-year catch up for transmission pole inspections and 7.5-year catch  
21 up for distribution pole inspections, the annual cost for pole inspections would be  
22 approximately \$350,000. After the program is caught up the costs per year to remain on  
23 cycle would decrease to approximately \$230,000 per year. I have also estimated that the  
24 trimming budget would require an additional \$650,000 per year to support an effective  
25 ROW management plan. This brings my total recommended adjustment to \$1,000,000.

1           Until GMP completes its studies, this is a reasonable estimate of what GMP needs to fund  
2           both tree trimming and pole inspections in order to provide safe and reliable service.

3       Q.     Please summarize your recommendations

4       A.           I recommend that the Board require GMP to report reliability statistics as laid out  
5           in the Reliability Task Force Report. I recommend that GMP undertake a study of tree  
6           trimming and pole inspection practices. For tree trimming, the company should develop a  
7           long range vegetative management plan which is implemented and supervised by an  
8           experienced utility arborist. A pole inspection program should be implemented which will  
9           allow the company to get on a ten-year inspection cycle.

10      Q.     Does that complete your testimony?

11      A.           Yes.